(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 818 208 A2

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
14.01.1998 Bulletin 1998/03

(51) Int. Cl.^{6}: **A61M 5/00**, A61B 1/00

(21) Application number: **97106755.8**

(22) Date of filing: **23.04.1997**

(84) Designated Contracting States:
AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV RO SI

(30) Priority: **09.07.1996 JP 178782/96**
09.07.1996 JP 178783/96
26.07.1996 JP 197491/96
05.02.1997 JP 22267/97

(71) Applicant:
ASAHI KOGAKU KOGYO KABUSHIKI KAISHA
Tokyo (JP)

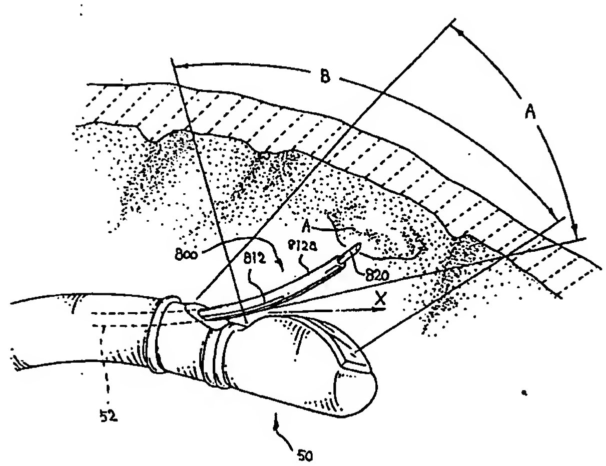
(72) Inventor: **Ouchi, Teruo**
Itabashi-ku, Tokyo (JP)

(74) Representative:
Schaumburg, Thoenes, Thurn
Patentanwälte
Postfach 86 07 48
81634 München (DE)

(54) **Injector instrument for an endoscope**

(57) An injector instrument for use with an endoscope. The injector instrument is provided with a needle formed of a synthetic resin or material which has a hardness within a range of Rockwell hardnesses of R50 to R129. Further, the sheath may be provided with a prebent or a directive bending portion, which follows the curvature of a bendable portion of an insertion part of the endoscope. Furthermore, the injector instrument may have a manipulation element which moves the fluid supply tube within the cover tube.

Fig. 8



EP 0 818 208 A2

Description

Technical Field

The invention relates to an injector instrument for an endoscope, which is used for injecting a medical fluid into tissue within a body cavity.

BACKGROUND ART

A conventional injector instrument includes a flexible cover tube made of synthetic resin or closely wound coil, and a fluid tube is inserted through the flexible cover tube. At the distal end of the fluid tube, a metal needle is connected.

By moving the fluid tube inside the cover tube, the needle is projected from or retracted inside the cover tube.

The injector instrument is inserted in a forceps channel of the endoscope when it is used. When the injector instrument is put through the forceps channel of an endoscope, the needle is retracted inside the cover tube so that the needle does not stick in the forceps channel. When the end of the needle has passed through the forceps channel, the fluid tube is pushed with respect to the cover tube, and the needle is projected from the cover tube.

The metal needle is generally relatively long and has a certain hardness. As shown in Fig. 5, when such a metal needle 10020 passes through a curved portion 20003 of a forceps channel 20002 of an endoscope 20000, the needle 10020, having a length A, may extend from the cover tube 10012 and pierce the wall of the forceps channel 20002. Further, the portion of the cover tube 10012 accommodating the needle 10020 may function as a rigid stick due to the rigidness of the needle 10020, and may damage another element, such as an optical fiber 20004 or the like, that is also enclosed in the curved portion 20003 of the endoscope 20000.

Additionally, when making an injection into an affected part, particularly if the affected part is on a slippery mucous surface, it is preferable to insert the needle of the injector instrument in the affected part at a right angle.

A known injector instrument is provided with a wire connected to the distal end of the cover tube and, by operation of the wire, the orientation of the needle is controlled.

However, the distal end portion of the injector instrument is very thin and is easily broken. In this case, since the end portion is bent a short distance by a thin wire, a relatively strong force is required, and the end portion is easily broken. Further, at a manipulation portion of the endoscope, the bending operation and a subtle injecting operation must be done simultaneously, a complicated and difficult procedure is required.

When the conventional injector instrument for the endoscope is used, an operator inserts the injector instrument into a forceps channel of the endoscope. During this stage, the needle is retracted inside the cover tube. When the injector instrument is inserted, the operator grasps a manipulation portion of the endoscope with one hand, and inserts the cover tube with the other hand.

When the tip of the injector instrument extends from the tip of the endoscope and enters the observing field of the endoscope, the needle is extended from the cover tube. In order to extend the needle, the fluid supply tube is further inserted into the cover tube at the manipulation side. It is difficult for the operator to push the fluid supply tube into the cover tube while also manipulating the endoscope, and thus an assistant pushes the inner tube according to the operator's instruction.

When the needle has been extended from the tip of the cover tube, the needle is stuck in the affected part of the human tissue. This is done by pushing the cover tube together with the fluid tube into the forceps channel of the endoscope.

When the needle is stuck into the affected part, medical fluid is supplied to the inner tube from the manipulation side. The medical fluid is supplied from an injector connected to the proximal end of the fluid supply tube, and operated by the assistant.

After the medical fluid is injected, the cover tube is pulled to remove the needle from the affected part. The needle is then retracted inside the cover tube by pulling the fluid supply tube, and lastly the cover tube is drawn out of the forceps channel of the endoscope to completely remove the injector instrument.

In each of the above steps of using the injector instrument, co-operation between the operator and the assistant is required.

An injection treatment requires a subtle manipulation of each part of the injection instrument and of the endoscope. However, if the operation of extending the needle from the cover tube, and the insertion of the needle in the affected part is divided and assigned to two different individuals, i.e., the operator and the assistant, the injection treatment is considerably difficult to perform accurately and requires both the operator and assistant to be skilled in the manipulation of the injector instrument and the endoscope.

SUMMARY OF THE INVENTION

It is therefore an object of the invention to provide an improved injector instrument which may not damage another member adjacent to the forceps channel when it is inserted in the forceps channel, especially when the forceps channel is curved.

Further, the invention is intended to provide an improved injector instrument allowing a needle to be appropriately oriented with respect to the affected portion.

Furthermore, the invention is intended to provide an

improved injector instrument with which the operator can insert a needle at a target position easily and accurately alone.

An injector instrument for insertion into a forceps channel of an endoscope, the injector instrument comprising a flexible fluid supply tube, a needle portion at a distal end of the fluid supply tube, and a cover tube, the cover tube being formed from a coiled wire, the fluid supply tube being slidably inserted into the cover tube, characterized in that the needle portion is formed from a material having a hardness within a range of Rockwell hardnesses of R50 to R129.

Since the needle has a hardness described above, the needle may not damage the other parts provided inside an endoscope when the injector instrument is inserted through a curved forceps channel.

The fluid supply tube and needle portion can be integrally formed.

The needle portion including an obliquely cut sharp tip.

It is noted that the needle portion can be formed of a flexible resin.

Further, the injector instrument can be provided with a detent mechanism, which holds the needle portion in at least one position with respect to the cover tube. When the needle is held to be extended from the endoscope by a predetermined amount, an operator can stick the needle in a affected part easily since the needle may not retracted as is held by the detent mechanism.

Optionally, the detent mechanism including an O-ring on one of the fluid supply tube and cover tube, and at least one groove on the other of the fluid supply tube and cover tube.

Furthermore, two grooves may be provided spaced a predetermined distance apart, and the needle portion having a movable distance within the cover tube which is less than the predetermined distance.

Further optionally, the injector instrument may be provided with a metal tip portion at the distal end of the cover tube.

Further, the needle portion has smaller diameter than the fluid supply tube, and wherein the metal tip portion is formed with an opening which allows the needle portion to pass through and prevents the fluid supply tube from passing through.

With the structure described above, the extending amount of the needle portion can be restricted.

According to another aspect of the invention, there is provided an injector instrument for insertion into a forceps channel of an endoscope, the injector instrument comprising a flexible fluid supply tube, a needle portion at a distal end of the fluid supply tube, a cover tube in which the fluid supply tube being slidably inserted, characterized in that the cover tub is formed to have a first curved portion at a distal end portion when th cover tube is in a neutral state.

The curved portion allows the needle portion to be directed to a portion which cannot be reached only by bending the bendable portion of the endoscope.

Optionally, the cover tube may include a second portion which has a tendency to bend in a predetermined direction with respect to a curvature of the first curved portion.

The second portion is located at a bendable portion of the insertion part of the endoscope when in use. With such a structure, when the bendable portion of the endoscope is bent, the orientation of the curved portion changes such that the bending tendency of the second portion follows the curvature of the bendable portion of the insertion portion of the endoscope. Thus, the direction of the needle portion can be adjusted.

The second portion can be replaced with a second curved portion which curves in a predetermined direction.

Further, the second curved portion may have a greater radius of curvature than the first curved portion.

The predetermined direction is the same, opposite, or any desired direction with respect to the first curved portion is curved.

The second portion may bend more easily than the first curved portion.

Furthermore, the needle portion is formed from a material having a hardness within a range of Rockwell hardnesses of R50 to R129. For example, the needle portion may be formed from a flexible resin.

Further, the fluid supply tube and the needle portion are integrally formed.

Further, the injector instrument may have a detent mechanism, the detent mechanism holding the needle portion in at least one position with respect to the cover tube.

The detent mechanism may include an O-ring on one of the fluid supply tube and cover tube, and at least one groove on the other of the fluid supply tube and cover tube.

Further, two grooves may be provided spaced a predetermined distance apart, the needle portion having a movable distance within the cover tube which is less than the predetermined distance.

Furthermore, the injector instrument may have a metal tip portion at the distal end of the cover tube.

Further optionally, the needle portion may have a smaller diameter than the fluid supply tube, and the metal tip portion may be formed with an opening which allows the needle portion to pass through and prevents the fluid supply tube from passing through.

According to further aspect of the invention, there is provided an injector instrument comprising a flexible fluid supply tube, a needle portion at a distal end of the fluid supply tube, a cover tube in which the fluid supply tube being slidably inserted, characterized in that the injector instrument further comprises a manipulation element, the manipulation element moving the fluid supply tube within th cover tube.

Optionally, the manipulation element has an outer

tube, and an inner tube, the inner tube being formed with a through hole in which the fluid supply tube is fixedly fitted, the cover tube being connected to the outer tube, the inner tube being slidably fitted in the outer tube.

Further, the manipulation element could be provided with a detent mechanism, the detent mechanism holding the needle portion in at least one position with respect to the cover tube.

Furthermore, the detent mechanism may include an O-ring on one of the fluid supply tube and cover tube and at least one groove on the other of the fluid supply tube and cover tube.

Still further, the detent mechanism may be provided with two grooves spaced a predetermined distance apart, the needle portion having a movable distance within the cover tube which is less than the predetermined distance.

Furthermore, the distal end of the cover tube may be formed to have a predetermined shape which prevents the distal end from slipping on a surface of a portion of a body tissue to be treated.

The distal end of the cover tube is formed to have a saw-tooth shape, a ring shaped blade. Alternatively, the distal end of the cover tube may be formed to have a V-cut, or an obliquely cut shape.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a sectional side view of an injector instrument according to a first embodiment of the invention;

Fig. 2 is a sectional side view of the injector instrument of Fig. 1 when a needle portion is extended;

Fig. 3 is a side view of an endoscope having a forceps channel, in which the injector instrument is to be inserted;

Fig. 4 is a schematic view illustrating the insertion of the injector instrument of Fig. 1 in the forceps channel;

Fig. 5 is a schematic view illustrating the insertion of a conventional injector instrument in a forceps channel;

Fig. 6 is a sectional side view of an injector instrument according to an second embodiment of the invention;

Fig. 7 is a sectional side view of the injector instrument of Fig. 6 when a needle portion is extended;

Fig. 8 is a schematic view illustrating the use of the injector instrument of Fig. 6 with the ultrasonic endoscope;

Fig. 9 is a schematic view illustrating the use of a variation of the injector instrument of Fig. 6 with the ultrasonic endoscope;

Fig. 10 is a schematic view illustrating the use of th injector instrument of Fig. 6 in the endoscope in a gastrointestinal tract;

Fig. 11 is a side view of a modified cover tube of th injector instrument of Fig. 6;

Fig. 12 is a schematic view showing the modified cover tube of Fig. 11 in the forceps channel;

Fig. 13 is a side view of an alternative structure for the modified cover tube of Fig. 11;

Fig. 14 is a schematic view showing the alternative modified cover tube of Fig. 13 in the forceps channel;

Fig. 15 is a side view of another modified cover tube of the injector instrument of Fig. 6;

Fig. 16 is a side view of an alternative structure for the modified cover tube of Fig. 15;

Fig. 17 is a schematic view illustrating the use of the injector instrument of Fig. 6 having the modified cover tube of Fig. 14 in the endoscope in a large intestine;

Fig. 18 is a sectional side view of an injector instrument according to a third embodiment of the invention;

Fig. 19 is a sectional side view of the injector instrument of Fig. 18 when a needle is extended;

Fig. 20 is a schematic view illustrating the operation of the injector instrument of Fig. 18 in the endoscope;

Fig. 21 is a schematic view illustrating press contacting the injector instrument of Fig. 18 on an affected part;

Fig. 22 is a schematic view illustrating the use of the injector instrument of Fig. 18 on the affected part;

Fig. 23 is a sectional side view of a modification of the injector instrument of Fig. 18;

Fig. 24 is a schematic view illustrating press contacting the injector instrument of Fig. 23 on an affected part;

Fig. 25 is a schematic view illustrating the use of the injector instrument of Fig. 23 on the affected part;

Fig. 26 is a sectional side view of a distal end of a variation of a cover tube of the injector instrument of Fig. 23;

Fig. 27 is a sectional side view of a distal end of another variation of a cover tube of the injector instrument of Fig. 23; and

Fig. 28 is a sectional side view of a distal end of yet another variation of a cover tube of the injector instrument of Fig. 23.

DETAILED DESCRIPTION OF THE EMBODIMENTS

Fig. 1 shows an injector instrument 900 according to a first embodiment of the invention.

The injector instrument 900 is provided with a fluid tube 11 and a cover tube 912.

The fluid tube 11 may be made of synthetic resin, such as nylon (Rockwell hardness: R106 - 120), polypropylene (Rockwell hardness: R80 - 110), polyimide resin (Rockwell hardness: R129), or the like. In accordance with necessity, harder or softer materials may also be used. For example, the fluid tube 11 may also be

made of superpolymer polyethylene (Rockwell hardness: R50), polypropylene (R80 - R102), or polyamide (R119). Thus, it is preferable that the fluid tube 11 as well as the needle portion 12 is made of material which has a hardness within a range of Rockwell hardnesses of R50 - R129. It is noted that the synthetic resin used need only meet a certain condition regarding hardness described below and that alternatives may be available. Further, the forceps channel is generally made of a material having a Shore hardness from D41 to D70.

The fluid tube 11 is integrally formed to include a needle portion 512. The needle portion 512 is formed to have a smaller diameter portion 512a, and, by cutting a distal end portion of the smaller diameter portion 512a of the fluid tube 11 obliquely, a sharp tip is formed.

Note that, with this structure, the smaller diameter portion 512a is more flexible and more easily bends to follow the curvature of the cover tube 912.

The proximal end of the fluid tube 11 is connected to the end of the inner tube 414. The other end of the inner tube 414 is provided with the fluid receiving mouth piece 415. The inner tube 414 is movable along its axis within an outer tube 416, which is connected to the proximal end of the cover tube 912.

The cover tube 912 is formed, for example, by closely winding stainless steel wire at a predetermined diameter.

When the cover tube 912 is made (i.e., the stainless steel wire is wound), a preload is applied. Therefore, the cover tube 911 neutrally extends straight, the each turn of the wire tends to contact the turn next thereto.

The injector instrument 900 is provided with a detent mechanism, which will be described below.

On the inner surface of the outer tube 416, at the proximal end thereof, an O-ring 417 is engaged. On the outer surface of the inner tube 414, first and second click grooves 418 and 419 are formed. By engaging the O-ring 417 with either one of the first click groove 418 or the second click groove 419, the relative position of the inner tube 414 and the outer tube 416 can be adjusted accurately. A predetermined stroke L4 is provided between the first and second click grooves 418 and 419.

In Fig. 1, the O-ring 417 is engaged with the first click groove 418, and the needle portion 13 is retracted inside the cover tube 912. The injector instrument 900 is inserted in or removed from the forceps channel 2 in this condition.

In Fig. 2, the O-ring 417 engages with the second click groove 419, and the needle portion 413 extends from the end of the cover tube 912 by a predetermined amount. The needle portion 512 is stuck into the affected portion in this condition. That is, the cover tube 912 is pushed towards the affected portion together with the fluid tube 11, with the needle portion 512 extended from the end of the cover tube 912.

At the distal end of the cover tube 912, a metal tip 921 is fixedly provided. The metal tip 921 is formed such that only the needle portion 512 can pass through. In particular, an inner surfac of the metal tip 921 is formed to be a gently flared tapered surface leading to an opening 922 formed at the distal nd of the metal tip 921.

The inner diameter of the opening 922 is less than the outer diameter of the fluid tube 11. Accordingly, if the fluid tube 11 is pushed forward (in the left-hand direction in Fig. 1), the portion of the fluid tube 11 where the needle portion 512 starts contacts the tapered surface and further movement is prohibited.

In this embodiment, a stroke (i.e., a movable amount) L3 of the needle portion 512 is arranged to be slightly less than the stroke L4 of the inner tube 414 such that, even if the injector instrument 900 (i.e., the fluid tube 11) is bent inside the forceps channel 2, the fluid tube 11 can be moved until the portion of the fluid tube 11 where the needle portion 512 starts contacts the edge of the opening 922. Accordingly, the extension amount of the needle portion 512 (shown in Fig. 2) is constant. Further, since the needle portion 512 is biased by the fluid tube 11 to extend from the metal tip 921, when the needle portion 512 is stuck in the affected part A, the position of the needle portion 512 is maintained.

As shown in Fig. 3, in use, the injector instrument 900 is detachably connected to an injector 14 and is removably inserted through a forceps channel 2 of an endoscope 1. An insertion portion of the endoscope 1 is inserted into a body cavity C.

As shown in Fig. 4, at a curved portion of the endoscope 1, the forceps channel 2 may curve in a relatively small radius but the needle portion 512 must still pass through. In this case, since the needle portion 512 is made of a synthetic resin having a certain elasticity and only the tip 921 is made of metal, but has a relatively small length B, the injector instrument 900 is less likely to break through or bind against the wall of the forceps channel 2 even at a curved portion. Accordingly, the injector instrument 900 according to the first embodiment does not damage any other elements in the endoscope 1 such as optical fiber or the like, and proceeds inside the forceps channel 2 smoothly even if it is curved.

Fig. 6 shows an injector instrument 800 according to a second embodiment of the invention.

The injector instrument 800 is provided with a cover tube 812 which is formed by synthetic resin having a predetermined elasticity.

A fluid tube 811 is slidably inserted inside the cover tube 812. The fluid tube 811 is a flexible tube also made of synthetic resin, having a predetermined elasticity. The distal end portion of the fluid tube 811 is formed as a needle portion 820 having a length L1, and having a smaller diameter, and the tip of the needle portion 820 is obliquely cut to form a point. The fluid tube 811 is neutrally straight, and bent, in Fig. 6, as inserted in the cover tube 812 having a curved portion 812a.

That is, the shape of the cover tube 812 in a neutral

condition is as shown in Fig. 6. In Fig. 6, the fluid tube 811 is also bent, however, this is du to the curvature of the cover tube 812.

At the distal end of the cover tube 812, a stopper 821 is provided. The stopper 821 has an opening formed to allow only the needle portion 820 to pass through but prevent the other portion of the fluid tube 811 from passing through. The stopper 821 functions when the needle portion 820 is extended from the cover tube 812, and the amount of the needle portion 820 extending from the cover tube 812 is a constant, as shown in Fig. 7. The stopper 821 may be fixed to the cover tube by, for example, an ultrasonic welding method.

The cover tube 812 and the fluid tube 811 may be formed in a similar manner to related elements in the first embodiment and may have relevant modified or alternative structures applied accordingly.

Fig 35 shows the injector instrument 800 when inserted in the forceps channel 52 of an ultrasonic endoscope 50. The needle portion 820 is to be inserted in the wall of the human cavity, and a medical fluid from an injector (not shown) connected to the mouth piece 415 is to be supplied through the fluid tube 811 to the affected part A.

In Fig. 8, if the cover tube 812 were not provided with the curved portion 812a, the needle portion 820 would extend in the direction indicated by the arrow X. However, since the cover tube 812 is provided with the curved portion 812a, it is possible to insert the needle portion 820 into the affected part A at a larger angle and in a position which is located at about a central position with respect to the optically observable area A as well as with respect to the ultrasonic scanning area B.

As shown in Fig. 9, if the curved portion 812a is curved more, even if the affected part A is in a narrower body cavity and therefore closer to the ultrasonic endoscope 50, the needle portion 820 can be inserted in the affected part A at about a central portion with respect to the optically observable area A as well as with respect to the ultrasonic scanning area B at an appropriate angle.

Fig. 10 shows an example where the injector instrument 800 is used in an endoscope 1 for a gastrointestinal tract. As shown in Fig. 10, if the injector instrument 800 is provided with a curved portion 812a having an appropriate length and curvature, the needle portion 820 can be inserted in the affected part A at an appropriate angle. In Fig. 10, the arrow X represents the direction in which the cover tube 812 would extend if the curved portion 812a were not provided.

Figs. 11 through 16 show modifications of the cover tube 812. In Figs. 11 through 14, a modified cover tube 812' is further provided with an easy-to-bend (ETB) portion 812b. The ETB portion 812b is located at a bendable portion 3 (see Fig. 12) of the endoscope 1 when the curved portion 812a is extended from the forceps channel 2 of the endoscope 1. In these examples, the ETB portion 812b bends easily at a greater radius of curvature than the curved portion 812a.

In Fig. 11, the curved portion 812a and the ETB portion 812b are curved in the same direction. As shown in Fig. 12, when the cover tube 812' is inserted in the endoscope 1, the cover tube 812' rotates inside the forceps channel 2 of the endoscope 1 so that the ETB portion 812b follows the curvature of the bendable portion 3. In this example, accordingly, the needle portion 820 is directed in the direction in which the bendable portion 3 of the endoscope 1 is curved.

In Fig. 13, the curved portion 812a and the ETB portion 812b curve in opposite directions. Accordingly, as shown in Fig. 14, the needle portion 820 is directed in an opposite direction to that in which the bendable portion 3 is curved.

As above, since the ETB portion is provided, the needle portion 820 can be accurately directed to a desired direction by bending the bendable portion 3 of the endoscope 1.

Figs. 15 and 16 show further alternatives of the cover tube 812. In Figs. 15 and 16, a modified cover tube 812" is further provided with a second curved portion 812b' instead of the ETB portion. The second curved portion 812b' is located at the bendable portion 3 of the endoscope 1 when the curved portion 812a is extended from the forceps channel 2 of the endoscope 1. In these examples, the second curved portion 812b' is pre-bent at a greater radius of curvature than the curved portion 812a.

In Fig. 15, the curved portion 812a and the second curved portion 812b' are curved in the same direction and in Fig. 16, the curved portion 812a and the second curved portion 812b' curve in opposite directions. Since the cover tube is made of the synthetic resin or some flexible material, the cover tube 812' follows the curvature of the bendable portion 3 of the endoscope, and accordingly, the alternatives shown in Figs. 15 and 16 function substantially similarly to the embodiments shown in Figs. 6 through 14.

Fig. 17 shows an example where the injector instrument 800 having, in this example, a modified cover tube 812" shown in Fig. 13 is used in an endoscope 1 for a large intestine. As shown in Fig. 17, the cover tube 812" rotates in the forceps channel 2 such that the second curved portion 812b' matches with the bendable portion 3 of the endoscope 1 and the curved portion 812a directs the needle portion 820 for insertion in the affected part A at an appropriate angle. In Fig. 17, the arrow X represents the direction in which the cover tube 812' would extend if the curved portion 812a were not provided.

Fig. 18 shows an injector instrument 20 according to an third embodiment. The injector instrument 20 is provided with a cover tube 21. The cover tube 21 is a flexible tube made of, for example, TFE (tetra-fluoroethylene) resin, and is slidably and detachably inserted in the forceps channel 2 of the endoscope 1 (see Fig. 20).

Note that the cover tube 21 is not necessarily a synthetic resin tube, and may be a metal coil tube or the like.

Inside the cover tube 21, a flexibl inner tube 22 is inserted. The inner tube 22 is movable along its axis within the cover tube 21. At the tip of the inner tube 22, an injector needle 23 is fixedly connected. By moving the inner tube 22 inside the cover tube 21, the needle 23 is extended from or retracted into the cover tube 21.

On an inner surface of the tip of the cover tube 21, a stopper 24 for restricting the needle 23 from extending more than a predetermined amount is provided. When a flange portion 23a, which is formed at the proximal end side of the needle 23, contacts the stopper as shown in Fig. 19, the needle 23 extends from the end of the cover tube 21 by a predetermined amount and is prevented from extending any further. The amount of movement of the needle 23 is referred to as the needle stroke L5.

As shown in Fig. 18, the injector instrument 20 also includes a manipulation portion 25 for sliding the inner tube 22 along its axis relatively to the cover tube 21. The manipulation portion 25 is provided with a main body 253 having a pair of flange members 251, which define a first finger hook 252. The proximal end of the cover tube 21 is connected to the main body 253 by a pressure nut 254.

The main body 253 is formed to have a cylindrical hollow portion in which a slider 256 is slidably fitted. At the proximal end of the slider 256, a second finger hook 255 is formed.

The outer surface of the inner tube 22 is fixed to the slider 256. Inside the main body 253, a strengthening pipe 26 is fixedly provided. The strengthening pipe 26 surrounds the inner tube 22 and an end of the strengthening pipe 26 is fixedly connected to the slider 256 while the other end is partially inserted in the cover tube 21.

On the outer surface of the slider 256, a pair of circumferential grooves 257 and 258 are formed. The distance between the grooves 257 and 258 along the axis of the slider 256 is defined as the slider stroke L6. On the inner surface of the main body 253, an O-ring 259, which is to engage with either one of the grooves 257 and 258, is provided.

By operating the slider 256 to slide with respect to the main body 253, when the O-ring 259 engages with either the groove 257 or 258, the slider 256 is temporarily fixed with respect to the main body 253 with a certain force.

In other words, the slider 256 moves within a range between a position where the O-ring 259 engages with the groove 257 and another position where the O-ring 259 engages with the groove 258 throughout the slider stroke L6.

The slider stroke L6 is set greater than the needle stroke L5. Accordingly, when the slider 256 is inserted into the main body 253, the flange portion 23a contacts the stopper 24 before th O-ring 259 engages with the groove 258. Therefore, even if the cover tube 21 is bent when the needle 23 is to be stuck in (see Fig. 19), the needle 23 is securely extended a predetermined length from the end of th cover tube 21. Further, since the needle 23 is slightly biased to extend straight by the inner tube 22, the needle 23 is securely inserted in the affected part A when the cover tube 21 is pushed against the affected part A and the needle 23 is extended.

The proximal end portion of the inner tube 22 extends from the slider 256. At the proximal end of the inner tube 22, an injector receiving mouth piece 27 is attached. By coupling an injector 28 to the mouth piece 27, and injecting medical fluid into the inner tube 22, the medical fluid is injected through the needle 23.

Fig. 20 shows an example where the injector instrument 20 is inserted in the forceps channel of the endoscope 1. In this example, a guide tube 21 is inserted in the forceps channel 2 of the endoscope 1, and the injector instrument 20 is inserted in the guide tube 21. The endoscope 1 is provided with the insertion portion (bendable portion) 3, the manipulation portion 4, and a tip 5 in which an objective optical system, and the like is accommodated.

As shown in Fig. 20, the manipulation portion 4 of the endoscope 1 is grasped by, for example, a left hand of an operator. While grasping the manipulation portion 4, the manipulation portion 25 of the injector instrument 20 can also be held by the left hand. With a finger and thumb hooked on the first and second finger hooks 252 and 255 respectively, the slider 256 can be moved in the direction indicated by an arrow "A" in Fig. 20 so that the needle 23 is extended from or retracted inside the cover tube 21.

Further, the cover tube 21 can be moved in relation to the endoscope 1 with, in this example, a right hand as shown in Fig. 20. Accordingly, when the injector instrument 20 according to the third embodiment is used, an assistant is required only to operate the injector 28 to inject the medical fluid.

Specifically, when the injector instrument 20 is used, the operator first grasps the manipulation portion 4 of the endoscope 1 with one hand (in this example, the left hand) and inserts the injector instrument 20 into the forceps channel 2 with the other hand (in this example, the right hand). During this stage, the needle 23 is retracted inside the cover tube 21.

Thereafter, when the tip end of the injector instrument 20 enters an observing area at the distal tip of the endoscope 1, the cover tube 21 is press contacted onto the affected part A as shown in Fig. 21 using the right hand.

Then, as shown in Fig. 22, the needle 23 is extended from the cover tube 21 to stick in the affected part A by operating (i.e., pushing in) the manipulation portion 25 of the injector instrument 20 with the left hand.

Thus, the operator is able to perform the series of operations alone. When the needle 23 has been

inserted in the affected part A, the assistant operates the injector 28 to supply medical fluid in accordanc with the instructions of the operator.

After injecting the medical fluid into the affected part A is completed, the operator retracts the needle 23 inside the cover tube 21 with the left hand, and then removes the injector instrument 20 from the endoscope 1 (i.e., from the forceps channel 2) with the right hand, or alternatively, the removal of the injector instrument 20 may be done by the assistant.

Fig. 23 shows an injector instrument 20' that is a modification of the injector instrument 20. In the injector instrument 20', the distal end 21a of a cover tube 21' is formed to have a saw-tooth shape so that the distal end 21a of the cover tube 21' digs into the affected part A firmly when the cover tube 21' is press contacted thereto.

With this structure, when the distal end 21a of the cover tube 21' is pressed against the affected part A (as shown in Fig. 24) and the needle 23 is extended from the cover tube 21' (as shown in Fig. 25), the cover tube 21' does not slip on the surface of the affected part A, and the needle 23 is inserted into the desired portion accurately.

It should be noted that the distal end 21a of the cover tube 21' may alternatively be formed to have a ring shaped blade 21b as shown in Fig. 26, a V-cut 21c as shown in Fig. 27, or may be obliquely cut 21d as shown in Fig. 28. Although it is not described further, various alternatives for preventing the distal end of the cover tube from slipping on the surface of the treated part can be used.

Claims

1. An injector instrument for insertion into a forceps channel of an endoscope, said injector instrument comprising a flexible fluid supply tube, a needle portion at a distal end of said fluid supply tube, and a cover tube, said cover tube being formed from a coiled wire, said fluid supply tube being slidably inserted into said cover tube, **characterized** in that said needle portion is formed from a material having a hardness within a range of Rockwell hardnesses of R50 to R129.

2. An injector instrument for insertion into a forceps channel of an endoscope, said injector instrument comprising a flexible fluid supply tube, a needle portion at a distal end of said fluid supply tube, a cover tube in which said fluid supply tube being slidably inserted, **characterized** in that said cover tube is formed to have a first curved portion at a distal end portion when said cover tube is in a neutral state.

3. The injector instrument according to claim 2, wherein said cover tube includes a second portion which has a tendency to bend in a pre-determined direction with respect to a curvature of said first curved portion or which curves in a pre-determined direction.

4. The injector instrument according to claim 3, wherein said pre-determined direction is the same direction in which said first curved portion is curved or wherein said pre-determined direction is an opposite direction in which said first curved portion is curved.

5. The injector instrument according to claim 3 or 4, wherein said second curved portion has a greater radius of curvature than said first curved portion.

6. The injector instrument according to anyone of claims 3 to 5, wherein said second portion bends more easily than said first curved portion.

7. The injector instrument according to anyone of claims 2 to 6, wherein said needle portion is formed from a material having hardness within a range of Rockwell hardnesses of R50 to R129.

8. An injector instrument for insertion into a forceps channel of an endoscope, said injector instrument comprising a flexible fluid supply tube, a needle portion at a distal end of said fluid supply tube, a cover tube in which said fluid supply tube being slidably inserted, **characterized** in that said injector instrument further comprises a manipulation element, said manipulation element moving said fluid supply tube within said cover tube.

9. The injector instrument according to claim 8, wherein said manipulation element comprises an outer tube, and an inner tube, said inner tube being formed with a through hole in which said fluid supply tube is fixedly fitted, said cover tube being connected to said outer tube, said inner tube being slidably fitted in said outer tube.

10. The injector instrument according to anyone of the preceeding claims, wherein the distal end of said cover tube is formed to have a pre-determined shape which prevents said distal end from slipping on a surface of a portion of a body tissue to be treated.

11. The injector instrument according to claim 10, wherein said distal end of said cover tube is formed to have a saw-tooth shape, a ring shaped blade, a V-cut or to be obliquely cut.

12. The injector instrument according to anyone of the proceeding claims, said fluid supply tube and needle portion are integrally formed.

13. The injector instrument according to anyone of the preceeding claims, said needle portion including an obliquely cut sharp tip.

14. The injector instrument according to anyone of the preceeding claims, said needle portion being a flexible resin.

15. The injector instrument according to anyone of the preceeding claims, further comprising a detent mechanism, said detent mechanism holding said needle portion in at least one position with respect to said cover tube.

16. The injector instrument according to claim 15, said detent mechanism including an O-ring on one of said fluid supply tube and cover tube and at least one groove on the other of said fluid supply tube and cover tube.

17. The injector instrument according to anyone of the preceeding claims, comprising two grooves spaced a pre-determined distance apart, the needle portion having a movable distance within said cover tube which is less than said pre-determined distance.

18. The injector instrument according to anyone of the preceeding claims, further comprising a metal tip portion at the distal end of said cover tube.

19. The injector instrument according to claim 18, wherein said needle portion has a smaller diameter than said fluid supply tube, and wherein said metal tip portion is formed with an opening which allows said needle portion to pass through and prevents said fluid supply tube from passing through.

Fig. 1

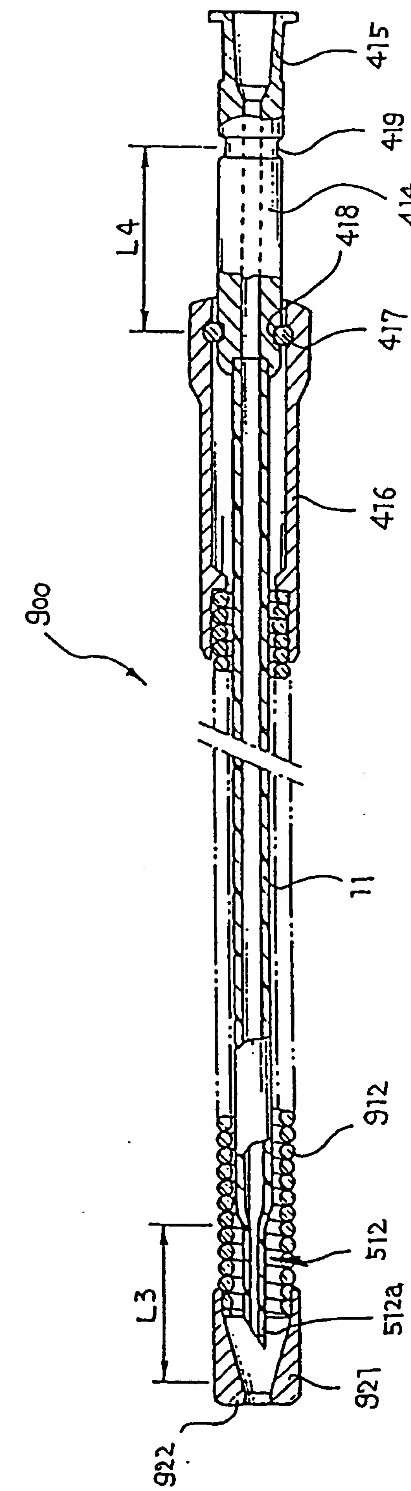


Fig. 2

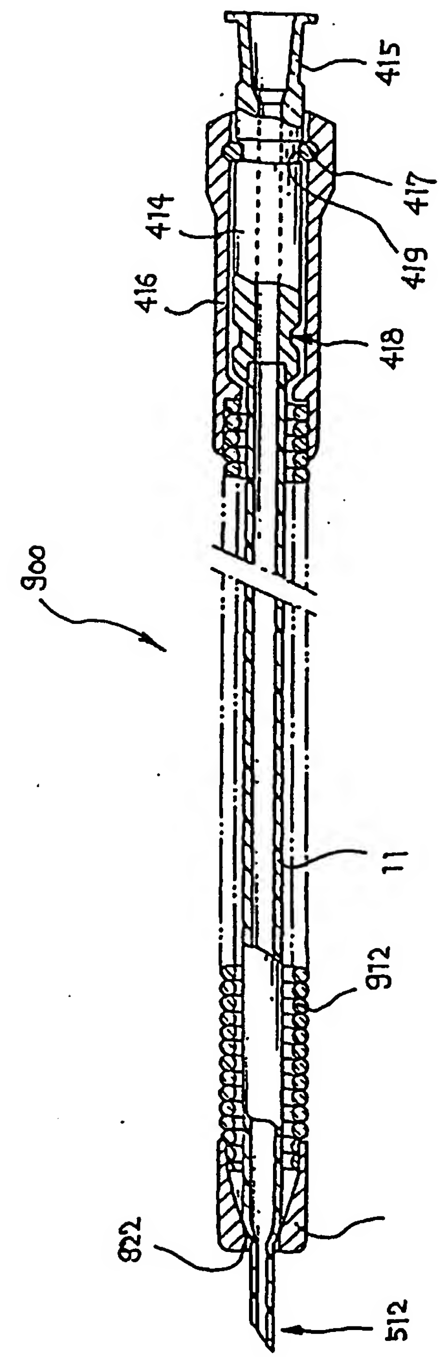


Fig. 3

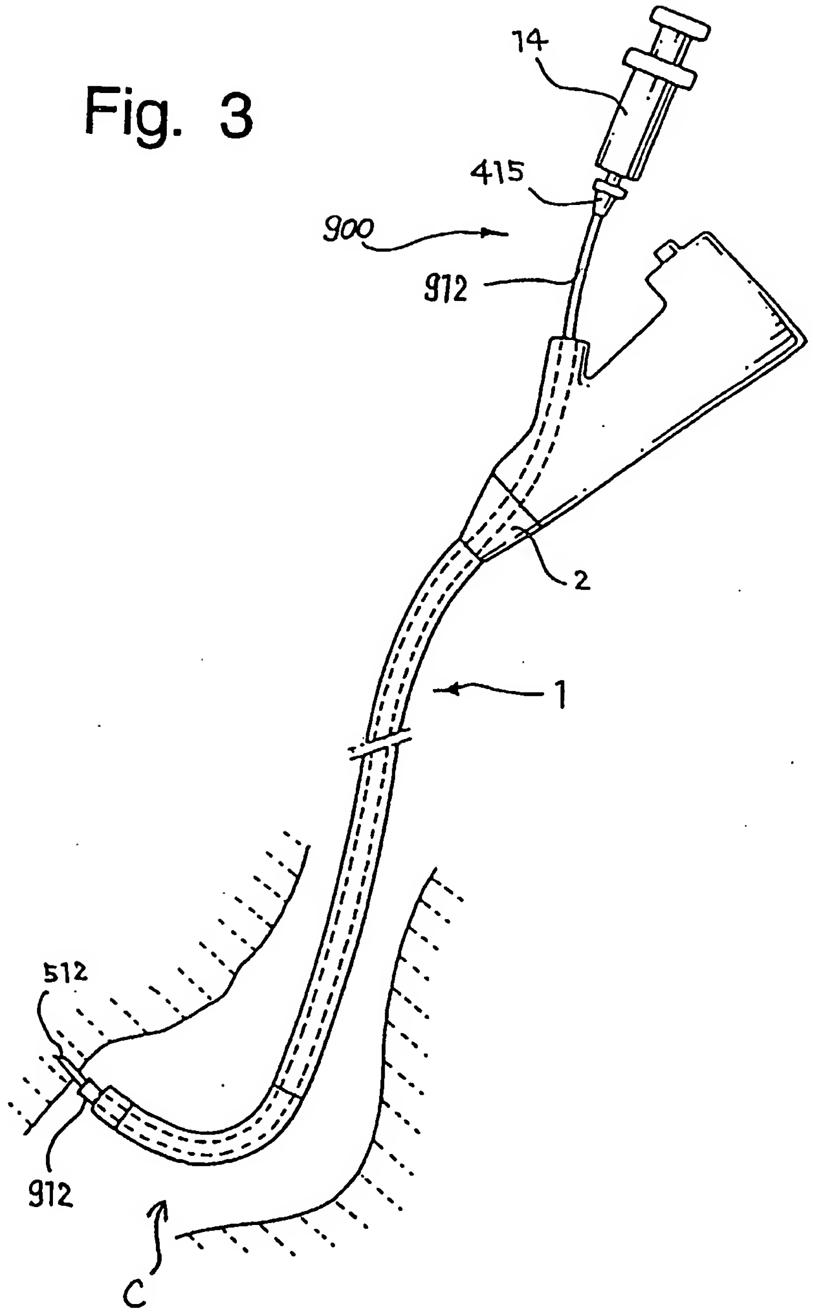


Fig. 4

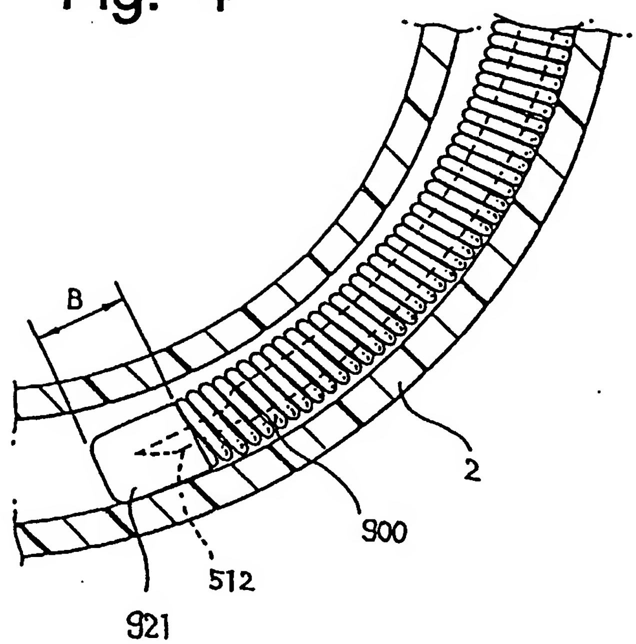


Fig. 5

PRIOR ART

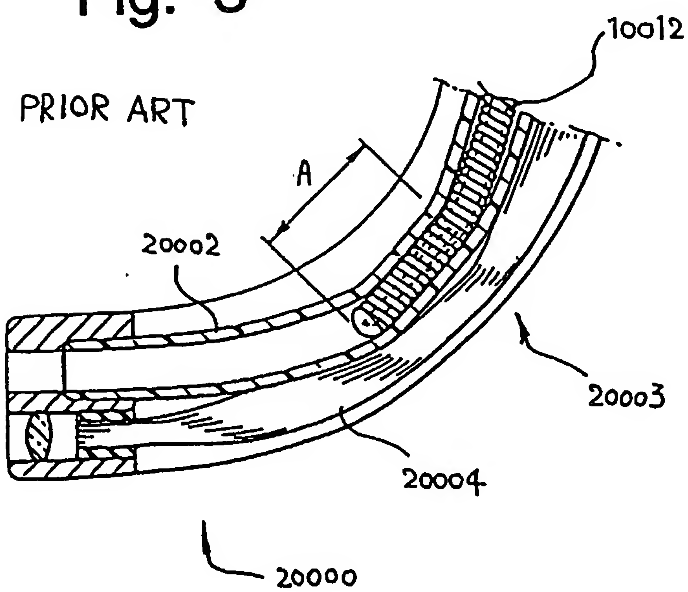


Fig. 6

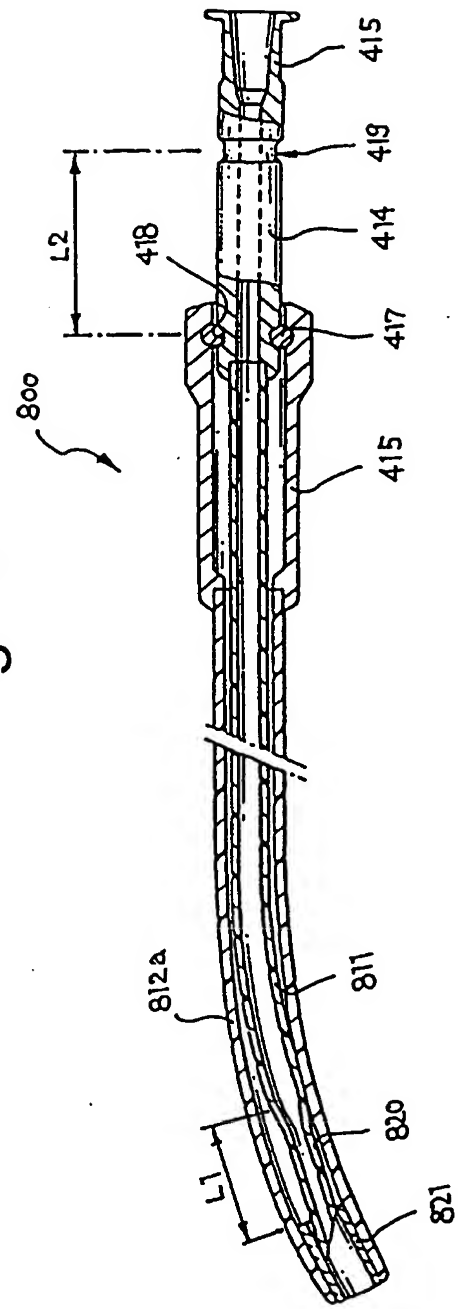
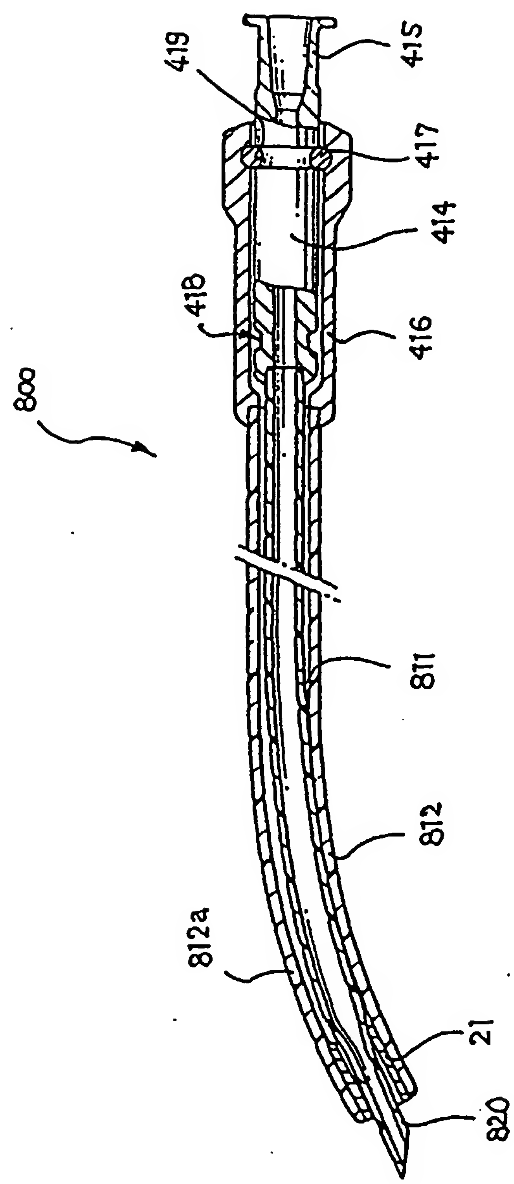


Fig. 7



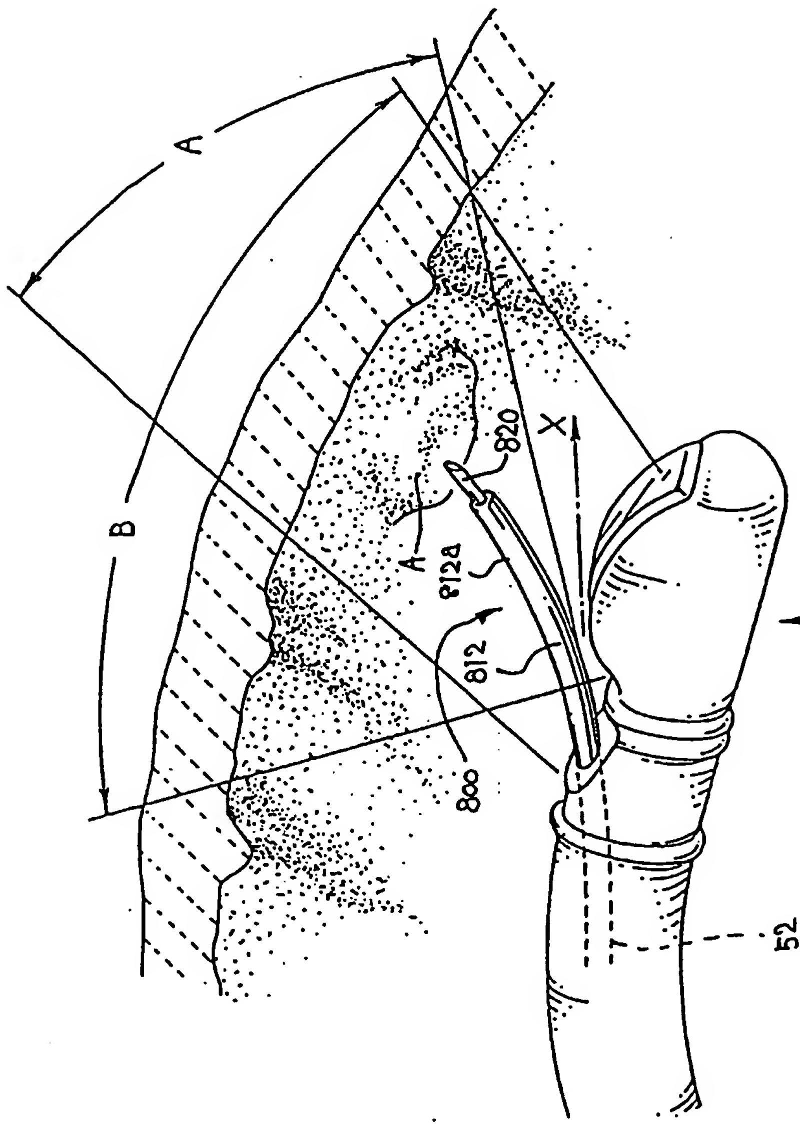


Fig. 8

Fig. 9

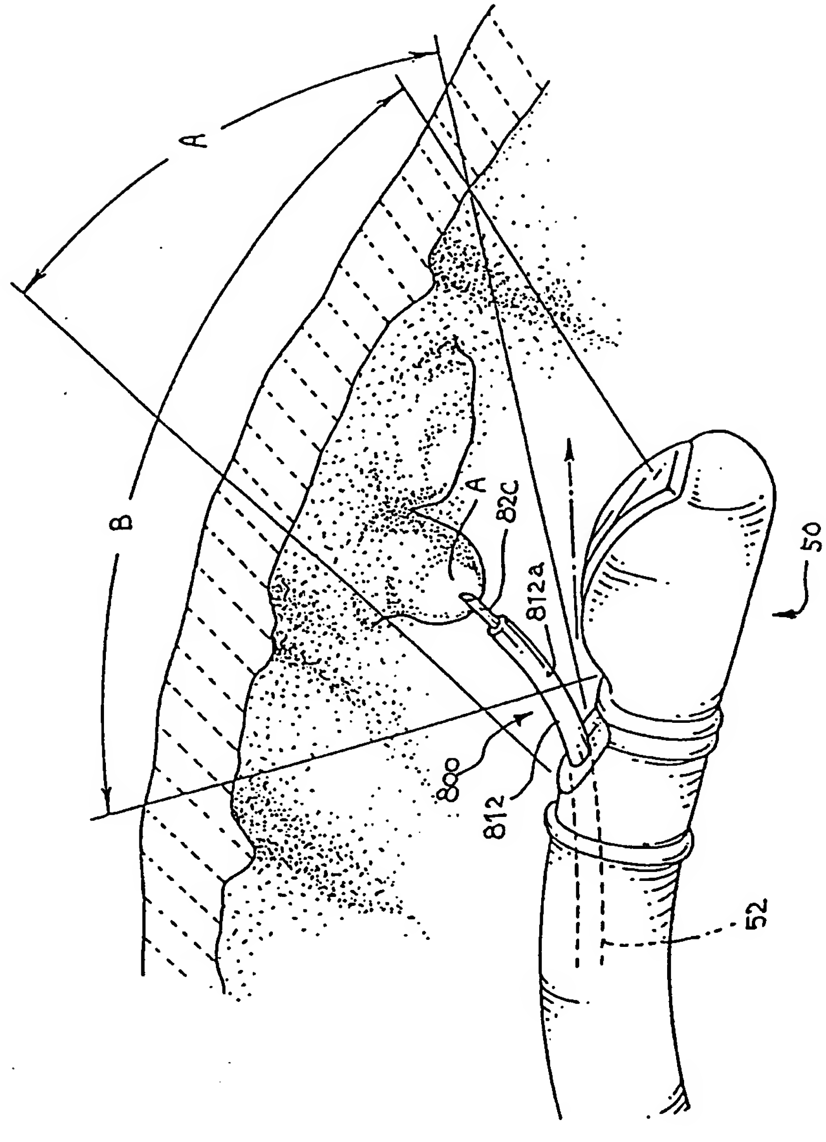


Fig. 10

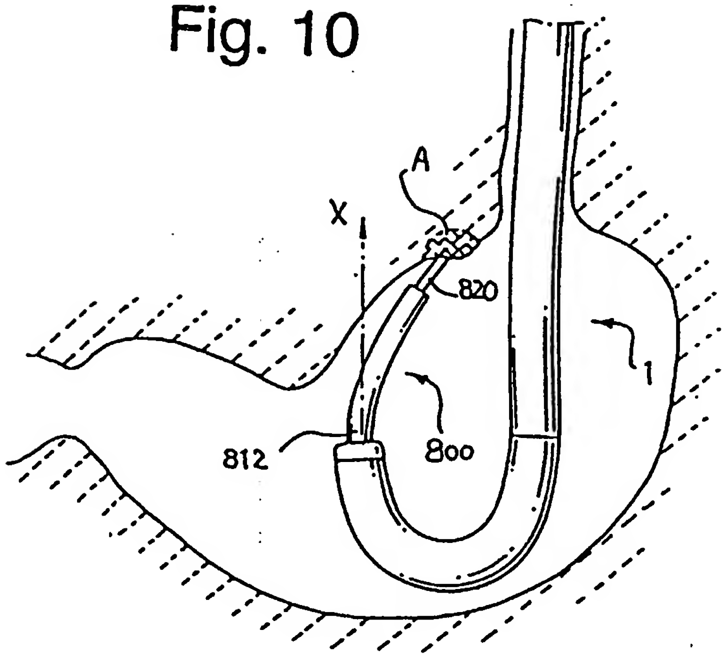


Fig. 11

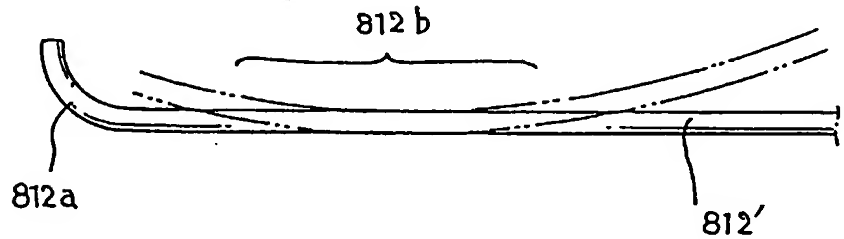


Fig. 12

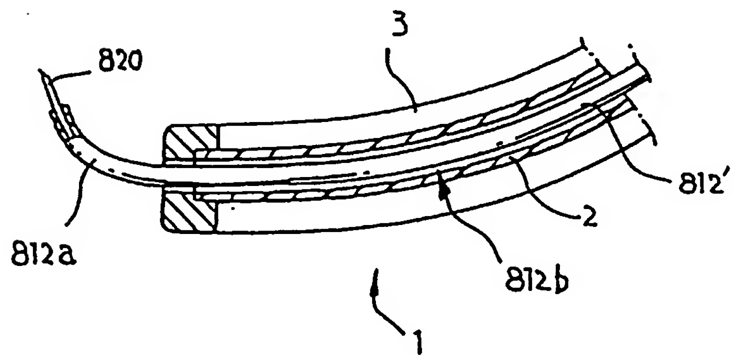


Fig. 13

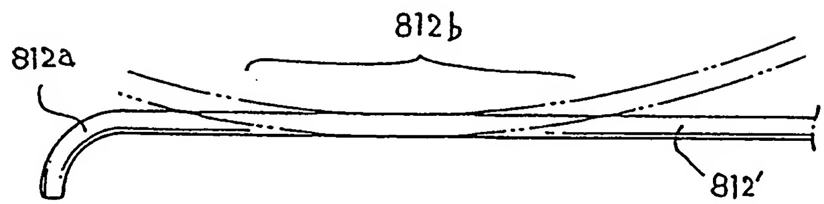


Fig. 14

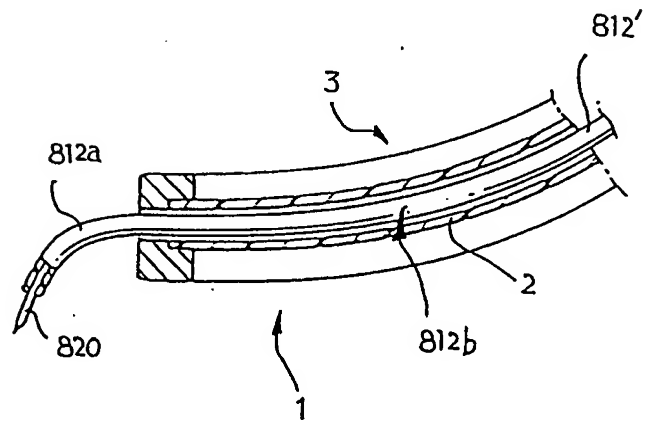


Fig. 15

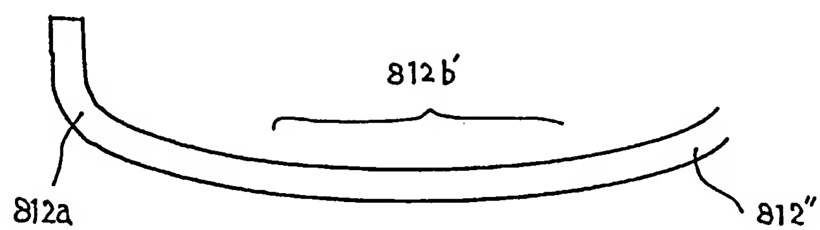


Fig. 16

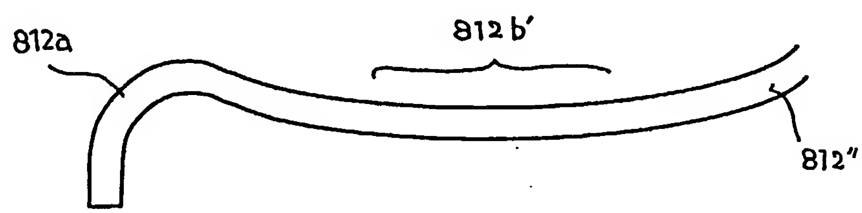
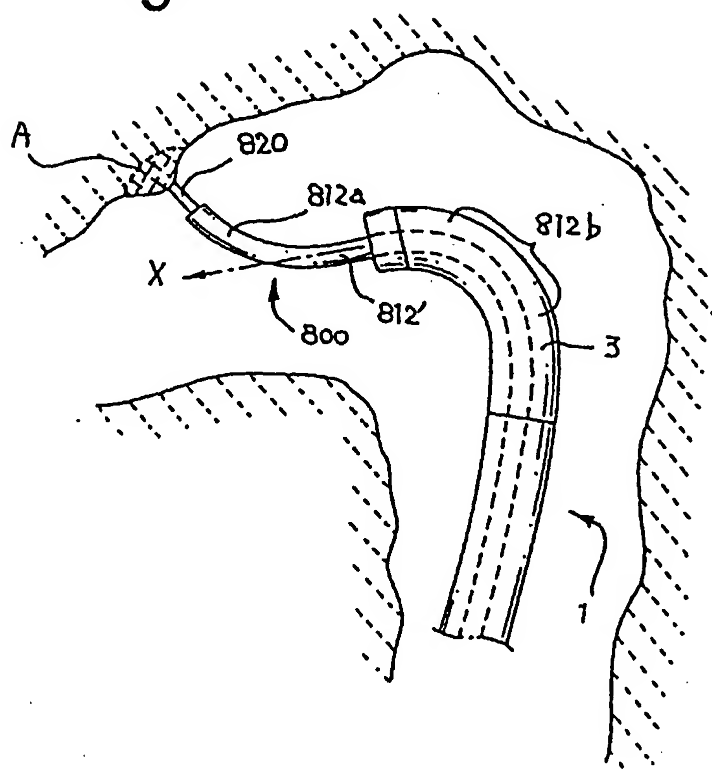


Fig. 17



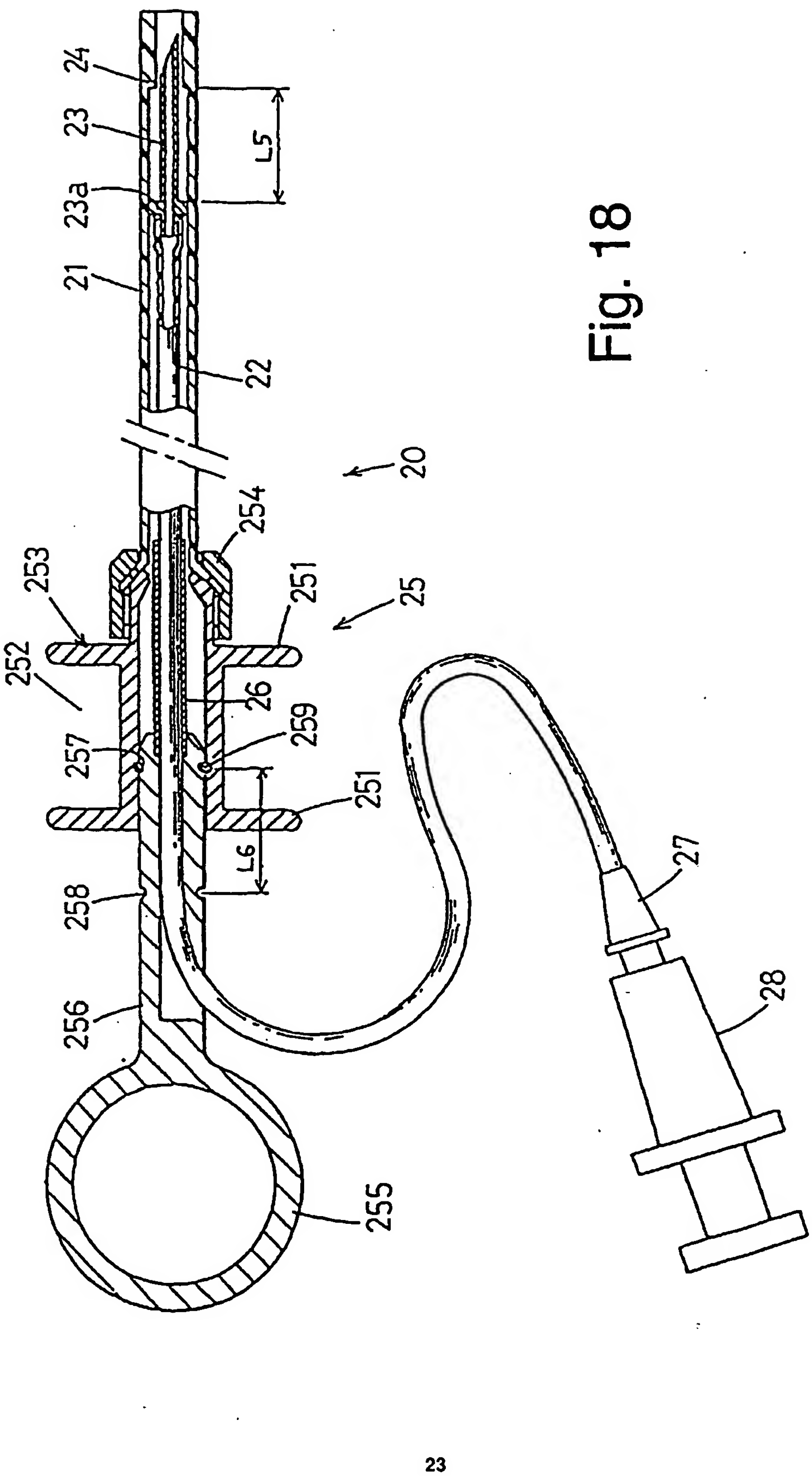

24
23
23a
21
22
L5
20
254
253
252
251
25
26
259
257
251
L6
258
256
255
27
28

Fig. 18

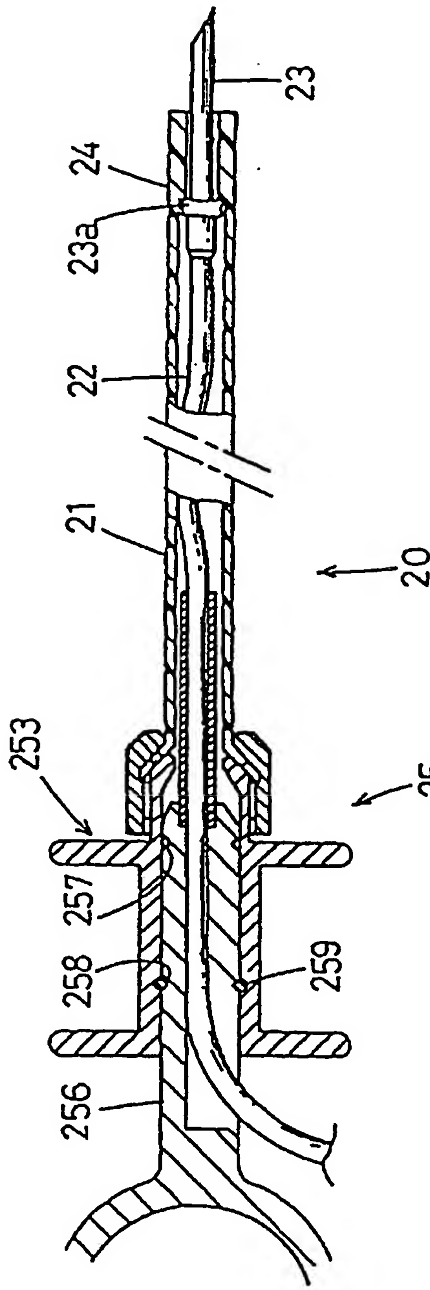


Fig. 19

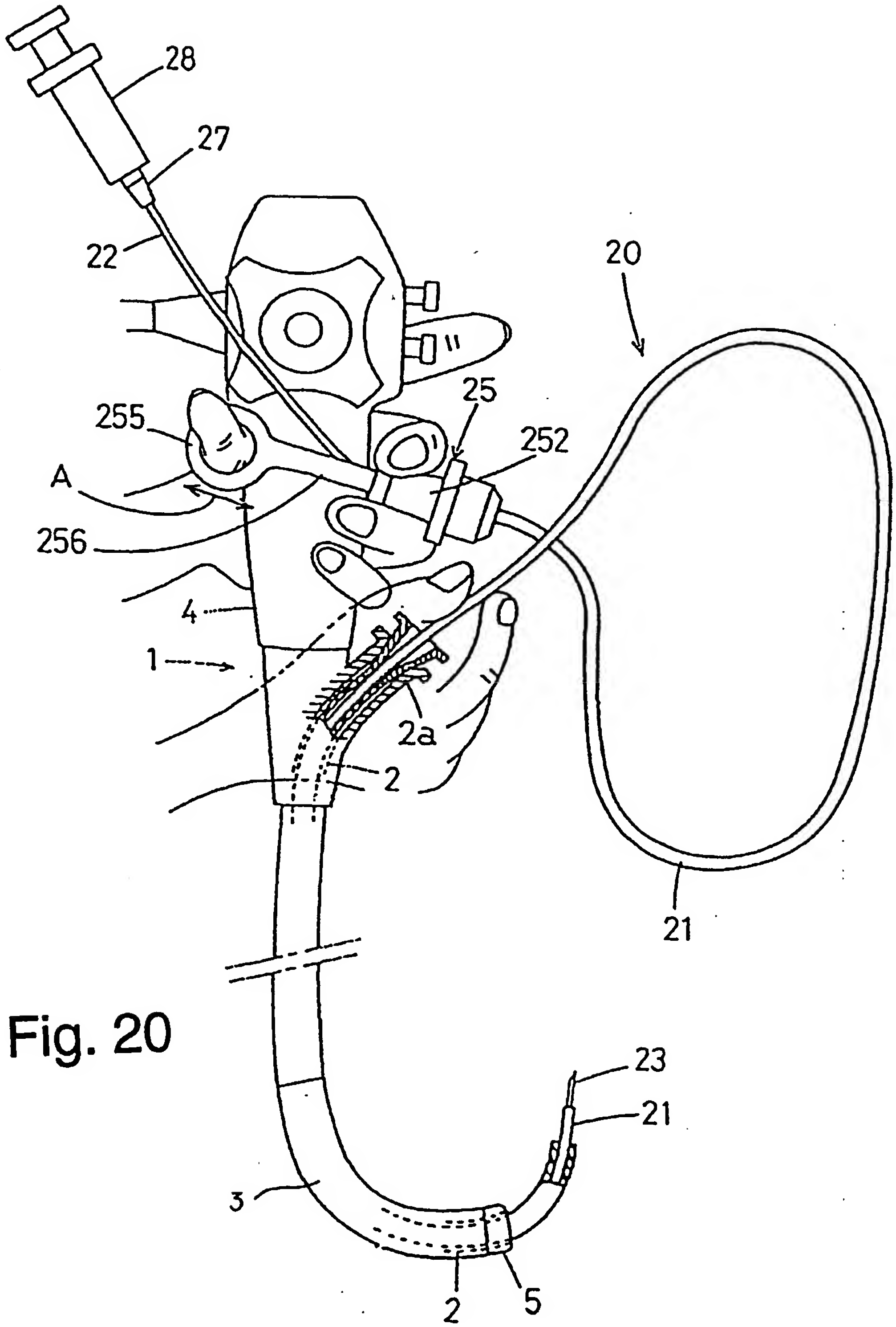


Fig. 20

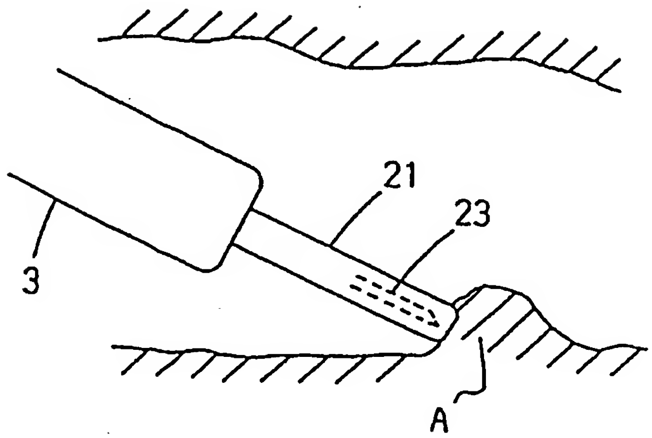


Fig. 21

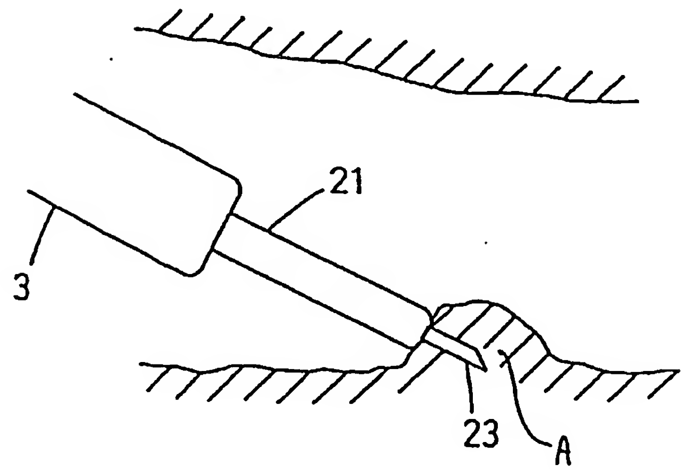


Fig. 22

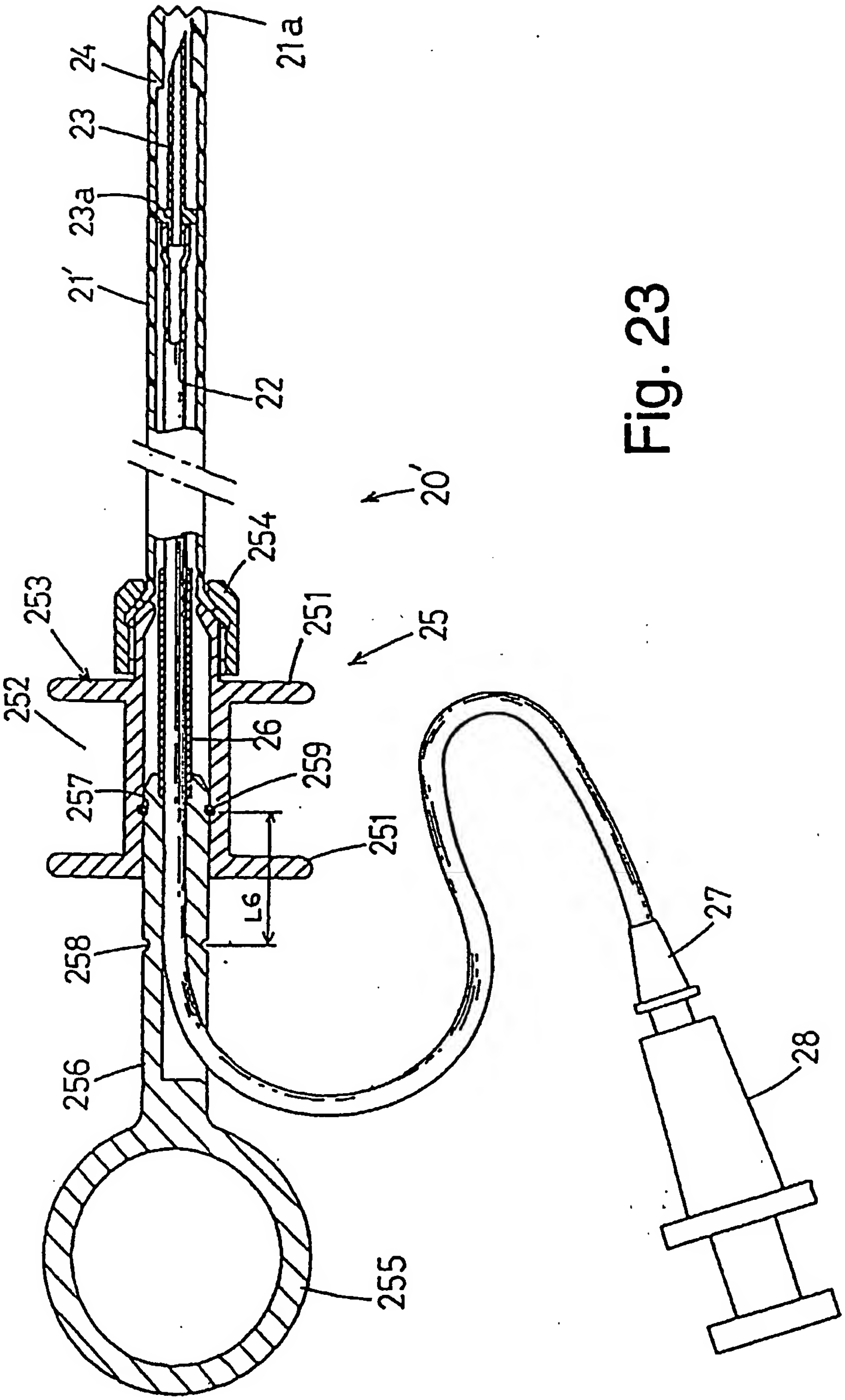

24
23
23a
21'
22
21a
20'
254
253
252
251
25
26
257
259
251
L6
258
256
255
27
28

Fig. 23

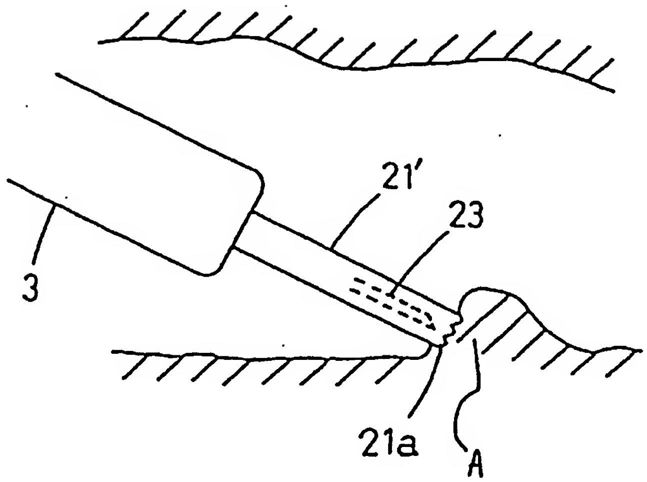


Fig. 24

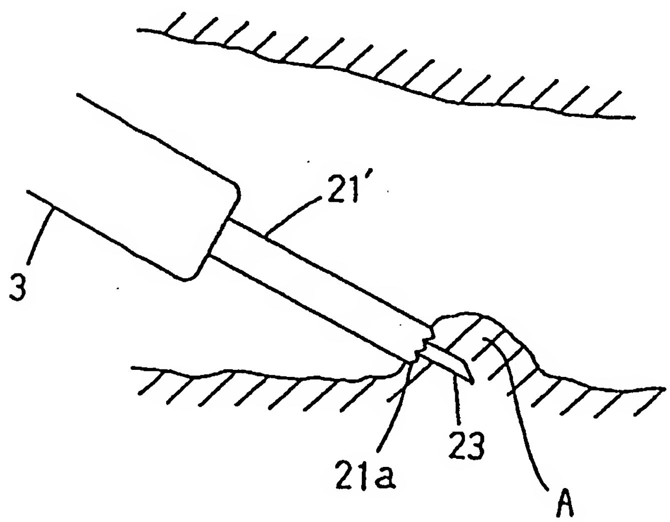


Fig. 25

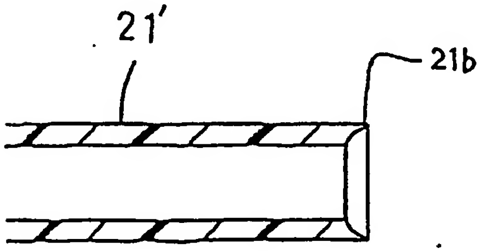


Fig. 26

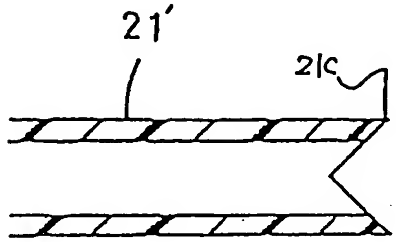


Fig. 27

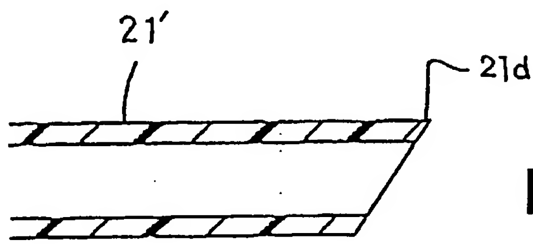


Fig. 28